

What is claimed is:

1. An atlas comprising a value representative of a magnetic property of a spatial location of a subject as determined by magnetic resonance.
- 5 2. The atlas of claim 1, wherein said value corresponds to a proton density value at a corresponding spatial location.
3. The atlas of claim 1, wherein said value corresponds to a T1 value at a corresponding spatial location.
4. The atlas of claim 1, wherein said value corresponds to a T2 value at a  
10 corresponding spatial location.
5. The atlas of claim 1, wherein said value corresponds to proton density, T1 and T2 values at a corresponding spatial location.
6. The atlas of claim 5, wherein said value corresponds to a tissue type.
7. The atlas of claim 1, wherein said value corresponds to a tissue type at a  
15 corresponding spatial location.
8. The atlas of claim 1, wherein said value corresponds to a diffusion tensor value at a corresponding spatial location.
9. The atlas of claim 1, wherein said value corresponds to a magnetization transfer value at a corresponding spatial location.
- 20 10. The atlas of claim 1, wherein said value corresponds to a T2\* value at a corresponding spatial location.
11. The atlas of claim 1, wherein said value corresponds to an anisotropy value at a corresponding spatial location.
12. The atlas of claim 1, wherein said value corresponds to a diffusivity value at a  
25 corresponding spatial location.

13. The atlas of claim 1, wherein said value corresponds to a corresponding spatial location in each of a plurality of subjects.

14. An atlas comprising values representative of a statistical representation of a magnetic property of a plurality of spatial locations of a plurality of subjects.

5 15. The atlas of claim 14, wherein said values of a statistical representation include a mean of magnetic property values at each corresponding spatial location of said plurality of subjects.

10 16. The atlas of claim 14, wherein said values of a statistical representation include a variance of magnetic property values at each corresponding spatial location of said plurality of subjects.

17. The atlas of claim 14, wherein said values of a statistical representation include a mean and a variance of intensities of each of a plurality of magnetic property values at each corresponding spatial location of said plurality of subjects.

15 18. The atlas of claim 17, wherein said values of a statistical representation further include prior probabilities of a plurality of tissue types at a plurality of corresponding spatial locations of said plurality of subjects.

19. The atlas of claim 18, wherein said mean and said variance of each of said plurality of magnetic property values at each corresponding spatial location are determined for each tissue type.

20 20. The atlas of claim 14, wherein said values of a statistical representation include a prior probability of a tissue type at each corresponding spatial location of said plurality of subjects.

21. The atlas of claim 20, wherein said values of a statistical representation further include a global prior probability of a tissue type for said plurality of subjects.

22. The atlas of claim 20, wherein said values of a statistical representation further include prior probabilities of a plurality of tissue types at each of a plurality of corresponding spatial locations of said plurality of subjects.

23. The atlas of claim 14, wherein said values of a statistical representation include  
5 global prior probabilities a plurality of tissue types for said plurality of subjects.

24. The atlas of claim 14, wherein said values of a statistical representation are population-specific.

25. The atlas of claim 14, wherein said values of a statistical representation are scanner-specific.

10 26. The atlas of claim 14, wherein said values of a statistical representation are acquisition sequence-specific.

27. The atlas of claim 26, wherein said values of a statistical representation contain magnetic resonance sequence parameters, including at least one from the group consisting of TR, TE and flip angle.

15 28. The atlas of claim 14, wherein said atlas contains information relative to an RAS coordinate system.

29. The atlas of claim 14, wherein said atlas contains information relative to a Cartesian coordinate system.

30. The atlas of claim 14, wherein said atlas contains data relative to image intensity  
20 of at least one subject of said plurality of subjects.

31. An atlas comprising values representative of a statistical representation of a plurality of magnetic properties of a spatial location of a subject.

32. The atlas of claim 31, wherein said values of a statistical representation include a mean of a magnetic property value at said spatial location.

33. The atlas of claim 31, wherein said values of a statistical representation include a variance of a magnetic property value at said spatial location.

34. The atlas of claim 31, wherein said values of a statistical representation include a mean and a variance of a magnetic property value at said spatial location.

5 35. The atlas of claim 34, wherein said values of a statistical representation further include prior probabilities of a plurality of tissue types at said spatial location.

36. The atlas of claim 35, wherein, for each of said tissue types, said mean and said variance of said magnetic property values at said spatial location are determined.

10 37. The atlas of claim 31, wherein said values of a statistical representation are scanner-specific.

38. The atlas of claim 31, wherein said values of a statistical representation are acquisition sequence-specific.

15 39. The atlas of claim 38, wherein said values of a statistical representation contain magnetic resonance sequence parameters, including at least one from the group consisting of TR, TE and flip angle.

40. An atlas, comprising:  
a plurality of nodes corresponding to a plurality of voxels of at least one subject;  
at a node of said plurality of nodes, a prior probability of a tissue type located at said voxel corresponding to said node; and

20 a statistical value of a magnetic property value of said tissue type located at said voxel corresponding to said node.

41. The atlas of claim 40, wherein said statistical value comprises mean and variance.

42. The atlas of claim 41:

wherein said voxels correspond to a plurality of subjects and a plurality of tissue types are located at said node; and

wherein said statistical value is comprised of a plurality of statistical values calculated for each of said tissue types located at said voxel corresponding to said node.

5 43. The atlas of claim 40:

wherein said voxels correspond to a plurality of subjects and a plurality of tissue types are located at said node; and

wherein said statistical value is comprised of a plurality of statistical values calculated for each of said tissue types located at said voxel corresponding to said node.

10 44. A system for obtaining information regarding a subject, comprising:

a magnetic resonance scanner adapted to obtain a magnetic resonance scan of said subject;

an atlas having magnetic property values derived from at least one other subject;

and

15 a processor adapted to receive information from said scanner pertaining to said magnetic resonance scan and adapted to read said atlas to enable a determination of alignment of said magnetic resonance scan to obtain a specific geometry of a subsequent magnetic resonance scan.

45. The system of claim 44, wherein a result of said determination of alignment is  
20 automatically communicated to said scanner from said processor to obtain a specific geometry of said subsequent magnetic resonance scan.

46. A method for obtaining information about a subject, comprising the steps of:

providing a magnetic resonance scanner;

providing an atlas having magnetic resonance data derived from at least one

25 other subject;

processing information received from said scanner pertaining to said subject;  
reading said atlas; and  
determining alignment of said magnetic resonance scan to obtain a specific  
geometry of a subsequent magnetic resonance scan.

5 47. The method of claim 46, further comprising the steps of:  
communicating alignment data from said processor to said scanner; and  
automatically aligning said magnetic resonance scan to obtain said specific  
geometry of a subsequent magnetic resonance scan by the use of said alignment data.

48. The method of claim 46, wherein said step of providing an atlas having magnetic  
10 property values derived from at least one other subject involves data derived from a  
plurality of other subjects.

49. The method of claim 46, wherein said atlas of said providing step further  
comprises tissue type prior probability data.

50. A method for obtaining information about a subject, comprising the steps of:  
15 providing magnetic property values corresponding to tissue types and pertaining  
to said subject;

providing an atlas having magnetic property values derived from at least one  
other subject; and

labeling tissue types of a tissue corresponding to said magnetic resonance  
20 property values pertaining to said subject by the use of said atlas having said magnetic  
resonance values derived from at least one other subject.

51. The method of claim 50, wherein said step of providing an atlas having magnetic  
property values derived from at least one other subject involves data derived from a  
plurality of other subjects.

25 52. A method for creating an atlas, comprising the steps of:

providing a first magnetic resonance modality volume pertaining to a subject and divided into voxels;

recording a magnetic property value in a node of said atlas corresponding to a voxel of said first magnetic resonance modality volume.

5 53. The method of claim 52, further comprising, before said recording step, the step of correcting distortion of said first magnetic resonance modality volume; and

54. The method of claim 52, further comprising the steps of:

providing a second magnetic resonance modality volume pertaining to a second subject and divided into voxels;

10 correcting distortion of said second magnetic resonance modality volume; and

updating said magnetic property data in said node of said atlas corresponding to a voxel of said second magnetic resonance modality volume.

55. The method of claim 52, wherein said step of correcting involves the correction of distortion caused by at least one of the group consisting of chemical shift, magnetic  
15 susceptibility, per-acquisition motion, gradients non-linearity, main magnetic field non-homogeneity, eddy currents, and Maxwell effects.

56. The method of claim 52, further comprising the steps of:

providing a plurality of magnetic resonance modality volumes pertaining to a plurality of subjects and each of said plurality of magnetic resonance modality volumes  
20 divided into voxels;

correcting distortion of each of said plurality of magnetic resonance modality volumes; and

updating said magnetic property value in said node of said atlas corresponding to a voxel of each of said plurality of magnetic resonance modality volumes;

wherein said magnetic property value in said node of said atlas includes statistical data.

57. A method for creating an atlas, comprising the steps of:

providing a first magnetic resonance modality volume pertaining to a subject and  
5 divided into voxels;

providing a labeled volume indicating tissue types of tissue corresponding to said voxels;

correcting distortion of said first magnetic resonance modality volume;

extracting magnetic property distribution parameters for each tissue type  
10 identified at each voxel; and

recording magnetic property data corresponding to each tissue type in a node of said atlas corresponding to a voxel of said first magnetic resonance modality volume.

58. The method of claim 57, further comprising the steps of:

providing a plurality of magnetic resonance modality volumes pertaining to a  
15 plurality of subjects and each of said plurality of magnetic resonance modality volumes divided into voxels;

providing a plurality of labeled volumes corresponding to said plurality of magnetic resonance modality volumes and indicating tissue types of tissue corresponding to said voxels;

20 correcting distortion of each of said plurality of magnetic resonance modality volumes; and

updating said magnetic property data in said node of said atlas corresponding to a voxel of each of said plurality of magnetic resonance modality volumes.

59. A method for creating an atlas, comprising the steps of:



obtaining a voxel intensity from an image representative of at least one magnetic modality of a voxel of a subject;

derive a magnetic property value from said voxel intensity; and

write said magnetic property value to a node of said atlas corresponding to said

5 voxel.

60. The method of claim 59, wherein said magnetic property value is at least one from the group of T1, T2 and PD.

61. A method for processing an image of a subject, comprising the steps of:

obtaining an image pertaining to magnetic property values of said subject;

10 providing an atlas having magnetic property values derived from at least one other subject;

aligning said image to said atlas;

segmenting said image into segments; and

labeling said segments to designate a tissue type of a tissue corresponding to said

15 magnetic property values pertaining to said subject by the use of said atlas.

62. The method of claim 61, further comprising the steps of:

calculating a prior probability of said tissue type at at least one spatial location of said at least one other subject and said subject;

20 calculating a statistical value of said magnetic property values representative of said at least one spatial location of said at least one other subject and said subject; and

writing said prior probability and said statistical value to a node of said atlas corresponding to said spatial location.